BELLCOMM, INC.
955 L'ENFANT PLAZA NORTH, S.W. WASHINGTON, D. C. 20024

SUBJECT: Trip Report - Discussion of the Multiple Docking Adapter Thermal Design at MSFC, September 16, 1968 Case 620

DATE: September 25, 1968

FROM: J. W. Powers

MEMORANDUM FOR FILE

J. E. Waldo and J. W. Powers visited MSFC September 16, 1968 to review the thermal design of the Multiple Docking Adapter (MDA). Messers Vaniman, Trucks and Fisher of organization R-P & VE-PTP were contacted. The purpose of the visit was to obtain and verify certain data relating to the thermal design of the MDA.

Those items of current interest which were discussed included the following:

Electric Heaters

Longitudinal electric strip heaters will be provided at eight evenly spaced circumferential locations on the inside surface of the MDA pressure shell. Two 20 watt heaters will be bonded to the wall at each of the 8 locations and extend the full length of the MDA cylinder. Control of these 16 heaters will be by ground command with a crew override provision. Thermostatically controlled surface heaters of the same type will be provided as required around the periphery of windows, docking ports and other perforations of the basic cylindrical insulation shell.

Insulation Configuration

The MDA's pressure vessel outer surfaces are covered with a high-performance, multi-laminar, radiation barrier insulation blanket approximately one inch thick. This blanket consists of 27 layers of double aluminized mylar film 0.003 in. thick. Individual film layers within the blanket are separated with 0.032 in. thick polyurethane foam spacer sheets slightly larger in area than the mylar. Outer facings of the blanket are thin porous fiberglass sheets. Cord tension ties connected to the facing sheets hold the insulation blanket together while the alternating foam sheets maintain the mylar film spacing. Design conductivity of the insulation blanket is [illegible] Btu/hr

A test vessel consisting of two docking ports and two 45° cylinder arcs is being used to evaluate the insulation. Current test results show a lower than design thermal conductivity for the basic insulation with some local penetrations colder than predicted. The net overall heat loss is less than anticipated.

Insulation Installation

Attachment of the insulation blankets to the outer surface of the MDA pressure shell presents potential design and installation problems for the following reasons:

- The blanket size (2.5 ft x 7.0 ft) is small compared with the total area to be insulated thus requiring many linear feet of total joint length.
- The installation must provide for rapid decompression of the blanket when exposed to the local vacuum space environment.
- Blanket installation procedure may cause a thickness compression with an attendant increase in thermal conductivity.
- The insulation blankets must be accurately trimmed and fitted around the many required protuberant structural elements including hundreds of supports for the radiator and meteoroid shield.
- The individual blankets must be bonded to the landed outer pressure shell over the purge gas tubes. The bonding of adjacent blankets must allow slight edge compression of foam sheets but no contact of mylar film for minimum parallel heat flow. Since the blankets are relatively soft, precise gauging by tooling will be difficult. Maintaining the requisite optimum location of adjacent insulation blankets will be a difficult problem with many process variables.

J. W. Powers

1022:JWP:ep

BELLCOMM, INC.

Subject: Trip Report - Discussion of the Multiple Docking Adapter Thermal Design at MSFC, September 16, 1968 Case 620

From: J. W. Powers

Distribution List

NASA Headquarters

Messrs. H. Cohen/MLR
P. E. Culbertson/MLA
J. H. Disher/MLD
J. A. Edwards/MLO
L. K. Fero/MLV
J. P. Field, Jr./MLP
T. A. Keegan/MA-2
H. T. Luskin/ML
M. Savage/MLT

MSFC

Messrs. R. R. Fisher/R-P&PTP
G. D. Hopson/R-P&VE-PT
H. F. Trucks/RP&VE-PTP
J. L. Vaniman/RP&VE-PTP

Bellcomm

Messrs. A. P. Boysen
D. A. Chisholm
D. R. Hagner
B. T. Howard
J. Z. Menard
I. M. Ross
J. W. Timko
R. L. Wagner

Div. 101 Supervision
Dept. 2015, 2034 Supervision
All Members Dept. 1021, 1022, 1024, 1025
Department 1023
Central File
Library